

WE CLAIM:

- 1 1. An isolated nucleic acid encoding a lepidopteran glutamate-gated chloride channel.
- 1 2. The isolated nucleic acid of Claim 1 wherein the nucleic acid is DNA or RNA.
- 1 3. The isolated nucleic acid of Claim 1 wherein the nucleic acid comprises a nucleotide  
2 sequence encoding the amino acid sequence of SEQ ID NO: 14.
- 1 4. The isolated nucleic acid of Claim 1 wherein the nucleic acid comprises the nucleotide  
2 sequence of SEQ ID NO: 13.
- 1 5. The isolated nucleic acid of Claim 1 wherein the nucleic acid comprises nucleotides 144  
2 through 1484 of SEQ ID NO: 13.
- 1 6. The isolated nucleic acid of Claim 1 wherein said nucleic acid has at least 80% sequence  
2 identity to the nucleic acid of Claim 5.
- 1 7. The isolated nucleic acid of Claim 1 wherein said nucleic acid has at least 90% sequence  
2 identity to the nucleic acid of Claim 5.

- 1 8. The isolated nucleic acid of Claim 1 wherein said nucleic acid has at least 95% sequence
- 2 identity to the nucleic acid of Claim 5.
- 1 9. A vector comprising an isolated nucleic acid encoding a lepidopteran glutamate-gated
- 2 chloride channel.
- 1 10. The vector of Claim 9 wherein the isolated nucleic acid comprises a nucleotide sequence
- 2 encoding the amino acid sequence of SEQ ID NO: 14.
- 1 11. The vector of Claim 9 or 10 further comprising a promoter operably linked to the isolated
- 2 nucleic acid.
- 1 12. A host cell comprising the vector of Claim 9 or 10.
- 1 13. A host cell comprising the vector of Claim 11.
- 1 14. A host cell expressing a recombinant lepidopteran glutamate-gated chloride channel.
- 1 15. A membrane preparation comprising a recombinant lepidopteran glutamate-gated
- 2 chloride channel.

- 1 16. A method of making a recombinant lepidopteran glutamate-gated chloride channel
- 2 comprising introducing a nucleic acid encoding a lepidopteran glutamate-gated chloride
- 3 channel into a host cell and culturing the host cell under conditions suitable for
- 4 expressing the nucleic acid.
- 1 17. The method of Claim 16 wherein the nucleic acid comprises a nucleotide sequence
- 2 encoding the amino acid sequence of SEQ ID NO: 14.
- 1 18. The method of Claim 16 wherein the host cell is an insect cell.
- 1 19. An amphibian oocyte comprising an isolated nucleic acid encoding a lepidopteran
- 2 glutamate-gated chloride channel.
- 1 20. An amphibian oocyte expressing a lepidopteran glutamate-gated chloride channel.
- 1 21. The oocyte of Claim 20 which is a *Xenopus* oocyte.
- 1 22. The oocyte of Claim 20 wherein the lepidopteran glutamate-gated chloride channel has
- 2 the amino acid sequence of SEQ ID NO: 14.

1 23. A method of identifying an agent that modulates the activity of a lepidopteran glutamate-  
2 gated chloride channel comprising applying a putative agent to a lepidopteran glutamate-  
3 gated chloride channel in the presence of chloride ions and measuring flux of chloride  
4 through the channel, wherein flux of chloride is indicative of an agent that modulates  
5 activity.

1 24. The method of Claim 23 wherein the chloride channel is in a host cell, a membrane  
2 preparation or an oocyte.

1 25. The method of Claim 23 wherein the chloride channel comprises the amino acid sequence  
2 of SEQ ID NO: 14.

1 26. A method of identifying an agent that modulates the activity of a lepidopteran glutamate-  
2 gated chloride channel comprising applying glutamate to a lepidopteran glutamate-gated  
3 chloride channel in the presence of chloride ions and measuring chloride flux; applying  
4 the putative agent and glutamate to a lepidopteran glutamate-gated chloride channel in the  
5 presence of chloride ions and measuring chloride flux; and comparing chloride flux in the  
6 presence and absence of the putative agent, wherein a change in chloride flux in the  
7 presence of the putative agent is indicative of an agent that modulates the activity of a  
8 lepidopteran glutamate-gated chloride channel.

- 1 27. The method of Claim 26 wherein the chloride channel is in a host cell, a membrane
- 2 preparation or an oocyte.
- 1 28. The method of Claim 27 wherein the chloride channel comprises the amino acid sequence
- 2 of SEQ ID NO. 14.
- 1 29. A method of identifying an agent that binds to a lepidopteran glutamate-gated chloride
- 2 channel comprising incubating a recombinant glutamate-gated chloride channel with a
- 3 radiolabeled ligand that specifically binds to the channel and a putative agent, and
- 4 measuring the ability of the agent to inhibit specific binding of the labeled ligand to the
- 5 channel.
- 1 30. An agent identified by the method of Claim 23, 26, or 29.
- 1 31. A composition comprising a recombinant lepidopteran glutamate-gated chloride channel
- 2 in a cell membrane.
- 1 32. The composition of Claim 31 wherein the lepidopteran glutamate-gated chloride
- 2 comprises the amino acid sequence of SEQ ID NO: 14.

- 1       33. The composition of Claim 31 wherein the membrane is in the form of a membrane
- 2                   preparation, an intact cell, or an oocyte.
  
- 1       34. A kit comprising a first container containing a recombinant lepidopteran glutamate-gated
- 2                   chloride channel in a cell membrane.
  
- 1       35. The kit of Claim 34 wherein the lepidopteran glutamate-gated chloride channel comprises
- 2                   the amino acid sequence of SEQ ID NO: 14.
  
- 1       36. The kit of Claim 34 wherein the membrane is in the form of a membrane preparation, an
- 2                   intact cell, or an oocyte.
  
- 1       37. The kit of Claim 34 further comprising a second container containing glutamate.